UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/620,318	07/22/2000	Tyler Lowrey	2024.21	1891

7590 03/12/2003

Philip H Schlazer
Energy Conversion Devices Inc
1675 West Maple Road
Troy, MI 48084

EXAMINER
CAO, PHAT X

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 03/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/620,318	Applicant(s) LOWREY ET AL.	
	Examiner Phat X. Cao	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *4/11/02 & 12/16/02* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *41-58 and 72-198* is/are pending in the application.

4a) Of the above claim(s) *See Continuation Sheet* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *72-82,84-100,102-115,117-131,133-141,143-157,177-181,184-189* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Continuation of Disposition of Claims: Claims withdrawn from consideration are 41-58,83,101,116,132,142,158-176,182,183 and 190-198.

DETAILED ACTION

1. Applicant's election without traverse of Specie I, in Paper No. 13 is acknowledged.

Claim Rejections - 35 USC § 112

2. Claim 121 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The limitation of having a ratio of the electrical contact greater than 5:6 is not supported by the original disclosure.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being

examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

4. Claims 72-82, 85-94, 96-100, 102-107, 109-115, 117-120, 122-125, 127-131, 133-141, 145-150, and 153-157 are rejected under 35 U.S.C. 102(e) as being anticipated by Gonzalez et al (US. 5,854,102).

Gonzalez discloses in Fig. 8 an electrically operated memory element, comprising: a volume of memory material 46 programmable to at least a first resistance state and a second resistance state (column 8, lines 34-40); and a polysilicon sidewall spacer (38,42) in electrical communication with the memory material 46, the polysilicon sidewall spacer (38,42) including a first region 38 doped with the second type dopant (column 7, lines 9-12) and having a first resistivity and a second region 42 heavily doped with the first type dopant (column 8, lines 11-13) and having a second resistivity, where the second region 42 is adjacent to the memory material 46 and the first region 38 remotes to the memory material 46, and wherein the polysilicon sidewall spacer (38,42) is substantially vertically disposed and perpendicular to the memory material. Gonzalez's Fig. 8 further discloses that substantially all of the electrical configuration occurs through the top surface or top edge of the electrical contact because the top surface or top edge of the electrical contact is in direct contact with the programmable resistance material 46 (column 7, lines 64-66), wherein the width of the electrical contact is in a range

between about 0.3 microns to about 0.8 microns (column 7, lines 66-67 through column 8, lines 1-2).

It is noted that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, claimed properties or functions are presumed to be inherent. *In re Best*, 195 USPQ 430, 433 (CCPA 1977). In this case, because the claimed and prior art electrical contacts are substantially identical in structure and because the claimed and prior art electrical contacts are produced by substantially identical processes (i.e., implanting a top portion of the second type dopant conductive plug (N type) with the first type dopant (P type) for providing a top portion comprising less dopant of the second type (N-)), the second region 42 of the electrical contact would inherently have the second resistivity greater than the first resistivity of the first region 38 of the electrical contact.

5. Claims 119-120, 122-131, 134-141, 143-144, 146-155, 157, 177-181, 184, 186-187, and 189 are rejected under 35 U.S.C. 102(e) as being anticipated by Ovshinsky (US. 5,687,112).

Ovshinsky discloses in Fig. 2 an electrically programmable, single-cell memory element, comprising: a volume of phase-change memory material 36 programmable to at least a first resistance state and a second state (column 7, lines 20-24) and a first contact (14,34) having a top surface or top edge directly in contact with the phase-change memory material 36 for substantially providing all of the electrical communication to the memory material 36 (see abstract) , the first contact (14,34) formed over the sidewall surface of the dielectric layer 18,

having a raised portion 16 with narrowed width extending to an end adjacent to the memory material, and comprising a conductive sidewall spacer 14 made of refractory metal of molybdenum or tungsten (column 14, lines 48-50) and having a first resistivity, and a conductive sidewall liner 34 made of carbon (column 15, lines 1-2) and having a second resistivity greater than the first resistivity, wherein the conductive sidewall liner 34 is adjacent to the memory material and spacedly disposed from the substrate 10, and the conductive sidewall spacer 14 is remote to the memory material. Ovshinsky further discloses in column 14, lines 35-40 that the first contact (14,34) can be formed as planar, vertically disposed or horizontally disposed by having a conical, pyramidal, elongated or wedge-shaped, and the first contact has a diameter of the raised portion being less than 2,000 angstroms (column 14, lines 51-64).

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 119-120, 122-123, 125-131, 134-141, 143-144, 146-152, 154-155, 157, 177-181, 186, and 189 are rejected under 35 U.S.C. 102(b) as being anticipated by Ovshinsky et al (5,414,271).

Ovshinsky discloses in Fig. 1 an electrically programmable, single-cell memory element, comprising: a volume of phase-change memory material 36 programmable to at least a first resistance state and a second resistance state (column 8, lines 24-27); and a first contact (32,34)

having a top surface or top edge in direct contact with the memory material 36 for substantially providing all of the electrical communication to the memory material 36 , the first contact (32,34) having a raised portion extending to an end adjacent to the memory material, and comprising a first region 32 made of refractory metal (column 16, lines 31-34) and having a first resistivity, and a second region 34 made of carbon (column 16, lines 34-35) and having a second resistivity greater than the first resistivity, wherein the second region 34 is adjacent to the memory material and spacedly disposed from the substrate, and the first region 32 is remote to the memory material.

Ovshinsky further discloses in Fig. 1 that the first contact layer (32,34) is substantially vertically and horizontally disposed, it has cup-like surface having an open end adjacent the memory material 36, and the area of contact between the first contact layer and the memory material is annular which encircles a cross-sectional slice of the memory material.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 121 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gonzalez et al (US. 5,854,102).

Gonzalez further discloses that the contact area between the top portion 42 of the conductive plug and the programmable resistance material can be varied by changing the size of the contact top portion of the conductive plug (see top portion 52 in Fig. 14). Therefore, it would have been obvious to form the first and second portions of the electrical contact of Gonzalez with a ratio as claimed because the size of the contact top portion of the electrical contact can be varied and optimized depending upon the resistance which is desired for the electrical contact.

10. Claims 84, 95, 108, 126, 143-144, 151-152, 177-181, 184-189 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonzalez et al in view of Doan et al (US. 6,423,621).

As discussed in details above, Gonzalez substantially reads on the above claims, except it does not disclose the electrical contact having a raised portion.

However, Doan (Fig. 12) teaches the forming of the electrical contact 102 having a raised portion 114 in contact with a programmable resistance material 120. Accordingly, it would have been obvious to modify the electrical contact of Gonzalez by forming a raised porion with the structure as set forth above because according to Doan, such electrical contact would provide denser memory arrays and would minimize the power requirements for memory cells (column 3, lines 1-5).

Response to Arguments

11. A) With respect to Gonzalez, Applicant argues that according to Appendix A provided by Applicant, the electrical contact of Gonzalez will not have the resistivity of the top portion and the resistivity of the bottom portion as suggested by the claimed invention.

Applicant's arguments are not persuasive because the graph in Appendix A shows the doping level of either N type or P type, but not show the relationship between the bottom portion of the electrical contact having a first dopant type (i.e., N type) and the top portion of the electrical contact having a first dopant type (i.e., n type) **doped** with a second dopant type (i.e., P type).

Applicant further argues that Gonzalez does not teach an electrical contact where substantially all electrical communication between the contact and the programmable resistance material occurs through an edge portion of the contact.

Applicant's arguments are not persuasive because Gonzalez's Fig. 8 clearly discloses the top surface or top edge of the contact in direct contact with the programmable resistance material 46. Therefore, all electrical communication between the contact and the programmable resistance material would substantially occur through the top surface or top edge of the contact (also see column 7, lines 64-66).

B) With respect to Ovshinsky (US. 5,687,112), Applicant argues that the second region 34 is not spacedly disposed from the substrate 10 because it actually touches the substrate 10.

Applicant's arguments are not persuasive because the feature of having the second region not touch the substrate does not seem to be required by the claim language. Therefore, the

second region 34 does suggest the invention as claimed because it clearly "spacedly disposed from said substrate [10]". Furthermore, Ovshinsky ('112) further discloses in column 14, lines 35-40 that the first contact (14,34) can be formed as planar, vertically disposed or horizontally disposed by having a conical, pyramidal, elongated or wedge-shaped.

Applicant further argues that the conductive layer 34 of Ovshinsky is not formed over the sidewall surface of the dielectric layer 18.

Applicant's arguments are not persuasive because the conductive 34 (Fig. 2) is clearly formed over the sidewall surface of the dielectric layer 18.

C) With respect to Ovshinsky (US. 5,414,171), Applicant argues that Ovshinsky ('271) does not teach an electrical contact where substantially all electrical communication between the contact and the programmable resistance material occurs through an edge portion of the contact.

Applicant's arguments are not persuasive because Ovshinsky's Fig. 1 clearly discloses the top surface or the top edge of the contact in direct contact with the programmable resistance material 36. Therefore, all electrical communication between the contact and the programmable resistance material would substantially occur through the top surface or the edge portion of the contact.

Conclusion

12. Applicant's **amendment B**, filed 4/11/02 necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP §

706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (703) 308-4917. The Examiner can normally be reached on Monday through Thursday. If attempts to reach the Examiner by telephone are unsuccessfully, the Examiner's supervisor, Wael Fahmy, can be reached on (703) 308-4918.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. Group 2800 fax number is (703) 308-7722 or (703) 308-7724.

PHAT X. CAO
PRIMARY EXAMINER

PC
March 9, 2003